Worksheet 2 Thinking ahead Answers

Task 1

1. Using the headings given, specify the inputs and outputs to the following problems:

   (a) Sort a list of names into alphabetical order and return the sorted list, leaving the original list unchanged.

   Name: sortList

   Inputs: A list of strings listString **[s_1, s_2, s_3, … s_n]**

   Outputs: A sequenced list of strings **[t_1, t_2, t_3, … t_n]**

   (identifiers may vary)

   (b) Find the average of a list of marks.

   Name: averageNum

   Inputs: A list of real numbers **listReals [r_1, r_2, r_3, … r_n]**

   Outputs: A real number

   (identifiers may vary, and some may choose to define the marks as integers. Is the output an integer? It is a decision to be made by the analyst/programmer.)

   (c) A tuple contains a list of student names and their marks for an exam. It is in the form ($name_1$, $mark_1$, $name_2$, $mark_2$, … $name_n$, $mark_n$) where $name_n$ is a string and $mark_n$ is an integer. A function is required to assign grades to each student according to their mark.

   Name: grades

   Inputs: A tuple **nameAndMark = (s_1, i_1, s_2, i_2, … s_n, i_n)** with alternating strings and integers

   A list **gradeUpperBoundaries = [b_1, b_2, , … b_n]** of integers

   A list **gradeNames** = [**g_1 , g_2 , ,…. g_n] of strings, e.g. A*, A, B, C … G**

   Outputs: A tuple **= (s_1 , g_1 , s_2 , g_2 , ,…. S_n ,g_n)** where s_1 …s_n are strings and g_1 ..g_n are corresponding grades

Task 2

2. Specify inputs, outputs and precondition for the following problem:

   Given two lists of integers, return a list in which each element is the sum of the corresponding elements in the two input lists.

   Name: **addLists**

   Inputs: Two lists of integers **jList =** $[j_1, j_2, j_3, \dots j_n]$

   and **kList =** $[k_1, k_2, k_3, \dots k_n]$

   Outputs: A list sumList = $[j_1 + k_1, j_2 + k_2, \dots. j_n + k_n]$

   Precondition: **jList** and **kList** are not empty lists and are the same length

   Again here, it is up to the programmer whether the two lists have to be non-empty, and the same length, or whether the sub-procedure will handle these conditions. The important thing is to specify what the preconditions are.

Task 3

3. A user working on a PC at home has done several searches on the Internet and leaves the browser windows opens when she shuts down. The next day, her mother needs to use the PC. On opening the browser, all the windows that were previously open, appear automatically.

   How does this happen? What are the advantages? What are the drawbacks? How can this situation be prevented?

   The pages are cached by the operating system and reloaded when the browser is loaded again.

   Advantage: often very convevient for the user, who can continue work from where they left off, without having to search for pages again

   Disadvantage: Possibly the user who loaded the pages may not want another user to see the pages they were looking at.

   The situation can be avoided if each user has their own login password.

4. Most of the time caching is behind the scenes and undetectable by the user. Apart from the example given in question 3, can you think of another example of caching which the user can see?

   In MS Office, the last several documents loaded in Word, PowerPoint, Excel, etc are displayed when you right-click, for fast reloading without going through a menu and finding the file in the correct folder.

   The operating system uses caching to keep recent program instructions and data used in special fast cache memory so that it can be quickly retrieved, for improved performance.